Behavioral ecology/animal behavior:

* Began as the newly coined scientific study ethology in the 1930’s; and is the . . .
* Science of how and why animals behave the way they do, especially in their natural environment.
* It has an emphasis on experimentation.
* There are two general subdivisions:
  1. Proximate causes – ask “how” questions, e.g. . . . How does a male song bird learn songs?
  2. Ultimate causes – ask “why” questions, e.g. . . .
* Why do parents risk their lives to keep their young safe?
The stotting “honesty symbol”

It is too costly to fake — the predator knows that the exhibitor can run really fast and thus doesn’t waste energy in pursuit!
Innate and learned components

* Innate behavior is . . .
  * Inborn; it does not require learning or experience.
  * It occurs in a regular sequence, and is . . .
  * Always performed in the same way. For example . . .
* Reflexes – instantaneous, automatic response to a stimulus;
* Taxis – movement toward or away from a stimulus;
* A fixed action pattern – is a sequence of innate behaviors performed to completion at any age, when triggered by a releaser (environmental cue);
Releaser may be visual, auditory, or chemical.

Nestlings begging for food is a fixed action pattern that stimulates parents to feed (another fixed action pattern).
Even humans have innate behaviors, e.g. the . . .

Nuzzling and suckling behavior of a human infant is innate. And . . .

Human babies have an innate response that causes them to back away from a visual cliff.
Learned behaviors – result from an animal’s experience.

* They are more changeable than innate behaviors.
* Trial-and-error learning – behaviors that are rewarded become more frequent, e.g. bike-riding.
* Imprinting – rapid learning that occurs only during a restricted time, early in the life of an animal – that never goes away for its entire life.
  - For example, goslings imprinted on Konrad Lorenz (1930’s) in the textbook example.
  - And endangered species raised in captivity reared by hand puppets that resemble mom.
* Habituation – when one learns not to respond to certain stimuli.
Innate behaviors and learning are interrelated.

* Innate behaviors do not occur without some interaction with the environment.
* Learning has a strong genetic component.
* Genes control the structure of sensory receptors, development of muscle cells, production of hormones, etc.; therefore, . . .
* DNA is the ultimate foundation for all behaviors, but its expression is altered by its environment (the organism’s environment).
There is a complex interplay between DNA and the environment.
Mutations

* Behavioral geneticists investigate the relationships between genes and behavior.
* That is the proximate cause of behavior.
* For example, with the fruit fly *Drosophila melanogaster* . . . zap the flies to . . .
* Induce mutation by irradiation, mate the flies, and look for abnormal behavior in the offspring. One that fits is . . .
* Foraging - two food searching behaviors - rovers and sitters - encoded genetically.
Rover larvae crawl equally between yeast food patches; whereas . . .

Sitter larvae concentrate on one patch.

There is some overlap in the traits (balanced polymorphism, i.e. both dominant and recessive traits persist), with ‘wild’ . . .

Populations usually about 70% rovers and 30% sitters.

The difference arises from allelic variation in the foraging (for) gene.

The rover allele (for<sup>R</sup>) is dominant over the sitter (for<sup>S</sup>) allele.

Explanation: in crowded environments, the selective advantage goes to rovers; however, . . .

Sitters have an advantage in less crowded conditions.
Fruit fly sexual behavior is also genetically encoded . . .

- The gene fruitless (fru) is responsible for most aspects of a male fruit fly’s sexual behavior.
- They have six courtship behaviors that occur in a particular sequence as a fixed action pattern. However, . . .
- Males with certain mutations of the fru genes court one another, forming ‘gay’ ‘conga’ lines several flies long.
Normal fruit fly courtship . . .

Versus all male fru mutants.
Human behaviors

* Most human behavior involves a complex interplay between DNA, surroundings, sensory receptors, the central nervous system, and all the actual cells carrying out the behavior.

* It’s hard to do controlled scientific experiments, because it is unethical to manipulate human genes. Regardless, . . .

* Most often many genes work together with the environment to influence a behavior, i.e. it’s not one gene = one behavior.
Twin studies have helped.

* If identical twins are more alike in some behavior than fraternal twins, there may be a genetic component to the behavior.

* "Separated at birth" studies often give us the best information.

* Studies on alcoholism, schizophrenia, and bipolar disorder all show that genes can predispose people to mental illnesses, but so can exposure to certain drugs or stress.
Animals live alone or in groups.

* “I’m so lonely” or “get me outa here.”
* Animals vary widely in their interactions with others of the same species.
* For example, two predatory mammals at opposite extremes of the spectrum are the . . .
* Solitary bobcat and the highly social wolf.
Bobcats (*Felis rufus*) . . .

- Spend most of their lives alone; especially the males.
- A male and female come together for only a few days to mate.
- The mother forces the juveniles out of her home range before they are one year old.
- Territorial behaviors evolved to mark and defend their home range; . . .
- Such as depositing urine or feces high up on a pile of dirt and dry leaves so that breezes will distribute the scent; . . .
- And marking trees with sweat gland scent filled scratches.
- Pheromones are chemicals released into the environment that influence the behavior of other organisms, usually of the same species, and usually sexually.
- Solitary behavior improves the bobcat’s reproductive success.
- Two major factors: limited food availability, and competition with other small to medium sized predators.
Versus the wolf (*Canis lupus*)

- Which is among the world’s most social mammals (many insects are even more so).
- They live together in packs composed of close relatives, with a very strong, but huge territory. And they . . .
- Hunt in groups to bring down large herbivore mammals like deer, elk, moose, and caribou.
- The pack’s social order governs eating order.
- Only the alpha pair mate and produce young.
- And the others help care for the young.
Cooperativity gains rewards in bringing down the big kills.

But the alpha male and female get to eat first!
Altruism is the opposite of...

- Selfish behaviors, which foster the survival of the individual at the expense of others.
- Whereas, altruism is self-sacrificing.
- Most altruism is expressed toward relatives (those kin with shared genes).
- Kin selection is an evolutionary mechanism that sacrifices an individual's genes for the sake of the genes that individual shares with its relatives.
Altruism in action...

- The Killdeer fakes a broken wing to draw predators away from its young.
- The Meercat posts sentries to warn the colony.
Social insects provide a great model.

- The social behavior of ants, bees, and wasps is rooted in their method of sex determination.
- Males develop from unfertilized eggs (haploid).
- Females develop from fertilized eggs (diploid).
- Therefore, a female worker is more closely related to her sisters than she is to her brothers, mother, or own offspring.
- It is to her advantage to care for her sisters instead of her own offspring.
Ants', termites', bees', and wasps' sisters share more of their genes together than with any other of their colony members.
A reminder . . .

You’ve still not gotten all your old exams! This is ridiculous. As I’ve repeatedly said over the entire semester - the final exam will be built directly off these old exams, and it’s worth 40% of the entire course grade. That’s the difference between failing and passing, maybe even getting a decent grade (e.g. 20% [full in-class credit] + 20% [only 50% on all section tests] + 40% [100% on final] = 80%, a “B” for the course, without any extra credit!).
Next, we’ll talk about...

Human impact on Gaia!